

# **Values and Ethics in Human-Computer Interaction**

**Other titles in Foundations and Trends® in Human-Computer Interaction**

*HCI's Making Agendas*

Jeffrey Bardzell, Shaowen Bardzell, Cindy Lin, Silvia Lindtner and Austin Toombs

ISBN: 978-1-68083-372-0

*A Survey of Value Sensitive Design Methods*

Batya Friedman, David G. Hendry and Alan Borning

ISBN: 978-1-68083-290-7

*Communicating Personal Genomic Information to Non-experts:  
A New Frontier for Human-Computer Interaction*

Orit Shaer, Oded Nov, Lauren Westendorf and Madeleine Ball

ISBN: 978-1-68083-254-9

*Personal Fabrication*

Patrick Baudisch and Stefanie Mueller

ISBN: 978-1-68083-258-7

*Canine-Centered Computing*

Larry Freil, Ceara Byrne, Giancarlo Valentin, Clint Zeagler,  
David Roberts, Thad Starner and Melody Jackson

ISBN: 978-1-68083-244-0

*Exertion Games*

Florian Mueller, Rohit Ashok Khot, Kathrin Gerling and  
Regan Mandryk

ISBN: 978-1-68083-202-0

# Values and Ethics in Human-Computer Interaction

---

**Katie Shilton**

University of Maryland, College Park, USA  
kshilton@umd.edu

**now**

the essence of knowledge

Boston — Delft

# Foundations and Trends<sup>®</sup> in Human-Computer Interaction

*Published, sold and distributed by:*

now Publishers Inc.  
PO Box 1024  
Hanover, MA 02339  
United States  
Tel. +1-781-985-4510  
[www.nowpublishers.com](http://www.nowpublishers.com)  
[sales@nowpublishers.com](mailto:sales@nowpublishers.com)

*Outside North America:*

now Publishers Inc.  
PO Box 179  
2600 AD Delft  
The Netherlands  
Tel. +31-6-51115274

The preferred citation for this publication is

K. Shilton. *Values and Ethics in Human-Computer Interaction*. Foundations and Trends<sup>®</sup> in Human-Computer Interaction, vol. 12, no. 2, pp. 107–171, 2018.

ISBN: 978-1-68083-467-3

© 2018 K. Shilton

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, mechanical, photocopying, recording or otherwise, without prior written permission of the publishers.

Photocopying. In the USA: This journal is registered at the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by now Publishers Inc for users registered with the Copyright Clearance Center (CCC). The ‘services’ for users can be found on the internet at: [www.copyright.com](http://www.copyright.com)

For those organizations that have been granted a photocopy license, a separate system of payment has been arranged. Authorization does not extend to other kinds of copying, such as that for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. In the rest of the world: Permission to photocopy must be obtained from the copyright owner. Please apply to now Publishers Inc., PO Box 1024, Hanover, MA 02339, USA; Tel. +1 781 871 0245; [www.nowpublishers.com](http://www.nowpublishers.com); [sales@nowpublishers.com](mailto:sales@nowpublishers.com)

now Publishers Inc. has an exclusive license to publish this material worldwide. Permission to use this content must be obtained from the copyright license holder. Please apply to now Publishers, PO Box 179, 2600 AD Delft, The Netherlands, [www.nowpublishers.com](http://www.nowpublishers.com); e-mail: [sales@nowpublishers.com](mailto:sales@nowpublishers.com)

# Foundations and Trends<sup>®</sup> in Human-Computer Interaction

Volume 12, Issue 2, 2018

## Editorial Board

### Editor-in-Chief

**Desney S. Tan**  
Microsoft Research

### Editors

Ben Bederson  
*University of Maryland*

Sheelagh Carpendale  
*University of Calgary*

Andy Cockburn  
*University of Canterbury*

Jon Froehlich  
*University of Maryland*

Juan Pablo Hourcade  
*University of Iowa*

Karrie Karahalios  
*University of Illinois at Urbana-Champaign*

Youn-Kyung Lim  
*Korea Advanced Institute of Science and Technology*

Nuria Oliver  
*Telefonica*

Orit Shaer  
*Wellesley College*

Kentaro Toyama  
*University of Michigan*

# Editorial Scope

## Topics

Foundations and Trends® in Human-Computer Interaction publishes survey and tutorial articles in the following topics:

- History of the research community
- Theory
- Technology
- Computer Supported Cooperative Work
- Interdisciplinary influence
- Advanced topics and trends

## Information for Librarians

Foundations and Trends® in Human-Computer Interaction, 2018, Volume 12, 4 issues. ISSN paper version 1551-3955. ISSN online version 1551-3963. Also available as a combined paper and online subscription.

# Contents

---

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Mapping the Literature: Interdisciplinary Approaches to Values and Ethics in Design</b>	<b>6</b>
2.1	Critique approaches . . . . .	7
2.2	Taking action with design . . . . .	13
<b>3</b>	<b>Designing Good: Controversies in Applying Values and Ethics to Design</b>	<b>20</b>
3.1	Vocabulary: Values, ethics and beyond . . . . .	21
3.2	Locating values and ethics . . . . .	24
3.3	Whose values? Challenges of inventories, frameworks, and plurality . . . . .	27
<b>4</b>	<b>Fitting Values to Design: Making Values an Explicit Design Practice</b>	<b>32</b>
4.1	Values advocates . . . . .	33
4.2	Real-time technology assessment and socio-technical integration research . . . . .	35
4.3	Values levers . . . . .	36
4.4	Ethical system development . . . . .	37
4.5	Toolkits for designers . . . . .	38

<b>5</b>	<b>Challenges and Opportunities for the Next</b>	
	<b>Generation of Values-Oriented Design</b>	<b>40</b>
5.1	Cultivating cultures of ethics in HCI . . . . .	41
5.2	Ethics for data-oriented design . . . . .	42
5.3	The limits of values and ethics in design . . . . .	44
<b>6</b>	<b>Conclusion</b>	<b>45</b>
	<b>Acknowledgements</b>	<b>48</b>
	<b>References</b>	<b>49</b>



# Values and Ethics in Human-Computer Interaction

Katie Shilton

*University of Maryland, College Park, USA; [kshilton@umd.edu](mailto:kshilton@umd.edu)*

---

## ABSTRACT

An important public discussion is underway on the values and ethics of digital technologies as designers work to prevent misinformation campaigns, online harassment, exclusionary tools, and biased algorithms. This monograph reviews 30 years of research on theories and methods for surfacing values and ethics in technology design. It maps the history of values research, beginning with critique of design from related disciplines and responses in Human-Computer Interaction (HCI) research. The review then explores ongoing controversies in values-oriented design, including disagreements around terms, expressions and indicators of values and ethics, and whose values to consider. Next, the monograph describes frameworks that attempt to move values-oriented design into everyday design settings. These frameworks suggest open challenges and opportunities for the next 30 years of values in HCI research.

---

# 1

---

## Introduction

---

Recent news has brought *values and ethics in technology design* to the forefront of public debate: questions about the goals and politics of human-designed devices, and whether the social interactions of those devices are good, fair, or just. For example, reporters have surfaced the role of social media platforms such as Facebook in the 2016 U.S. election (Doubek, 2017; Rosenberg *et al.*, 2018). Designers have spoken out about the psychological tricks phone apps use to hog user attention (Lewis, 2017). *Weapons of Math Destruction* (O’Neil, 2017), an overview of problems of bias in mathematical modeling, was a *New York Times* bestseller and long-listed for the National Book Award. *Technically Wrong: Sexist Aps, Biased Algorithms, and Other Threats of Toxic Tech* accused “an insular industry” of creating alienating and harmful technologies (Wachter-Boettcher, 2017, p. 9). High-profile university computing programs are reporting increased demand for ethics courses (Singer, 2018).

*How* to avoid biased practices, and instead conduct ethical, just design has been a topic of investigation and conversation within human–computer interaction (HCI) for more than 30 years. Long the province of academic debate, it is edifying to see news and industry sources

paying close attention to bias and unfairness in the complex network of designers, technological systems, users, and indirect stakeholders that make up our sociotechnical world. This complex sociotechnical network, however, also explains why this discussion has gone on so long, and why it is so challenging. Avoiding bias and unfairness when people and systems are thoroughly entangled is a wicked problem. Technologies may have unpredictable effects, and users may have unpredictable reactions. Direct and indirect stakeholders of technologies are difficult to enumerate. Our design practices may impact people beyond our users, whether through the collection and use of information about people during design, through secondary unintended consequences, or because of the natural resources our technologies use.

If there were clear rules to follow, HCI would have long ago demonstrated how to avoid biased design. Instead, we have rich debates over what constitutes a “value” or an “ethic”; ontological dilemmas over where such entities or actions might reside in people, technology, or their interaction; questions of agency and intention in design; and reflective, almost artisanal design practices designed to bring all of these questions to the forefront of development.

The good news is that more people are engaging with the wicked problem of values and ethics in design. For example, Borning and Muller (2012) note the large increase in papers in the ACM Digital Library mentioning “human values,” from 20 in 2000 to 113 in 2010. By this measure, attention has only increased: the number of papers mentioning “human values” has nearly doubled again (to more than 210) by 2017.<sup>1</sup> Adding “ethics” and restricting the search to abstracts expands the number exponentially, to more than 4,000, with most of those papers authored after 2000. At CHI 2017, workshop participants authored the “Denver Manifesto” to “unequivocally state that values play key roles in the design, development and deployment of technologies and that there is a need for discussion and action on the topic” (Ferrario, 2017). In an introduction to an edited collection on design and ethics,

---

<sup>1</sup>Scholarly publication in general is estimated to grow 8–9% per year (Bornmann and Mutz, 2015). Human values research well outpaced that growth between 2000 and 2010, although not between 2010 and 2017.

Zelenko and Felton (2012) describe “an ‘ethical turn’ occurring in . . . the design fields.” Van den Hoven similarly describes both “a value turn in engineering design and on the other hand a design turn in thinking about values” (van den Hoven, 2017, p. 66).

An ethical turn hardly seems new to HCI, a field long concerned with accessibility, usability, and participation. This review monograph considers accumulated wisdom about how to design just, ethical systems in HCI and cognate areas such as philosophy of technology, science and technology studies (STS), and information studies. Section 2 describes these interdisciplinary approaches within the literature on values and ethics in design. It maps the roots of values-oriented design in philosophy of technology and describes critical traditions that sensitized academics and designers to the ethical issues in their work. It then describes movements within HCI that seek to take ethical action using design methods.

Section 3 dives into controversies within these literatures. It tackles meaning and ontology, describing why different literatures use “values,” “ethics,” or other terms, and what is signaled by this terminology. It then discusses the problem of recognizing and locating values and ethics, including scholarship that positions values as attributes of people, features of technology, or elements of practice. The section also explores controversies centered on the power and agency of designers, including questions of *whose* values matter to design, and to what degree designers influence the values associated with a technology.

Section 4 departs from controversies to build a practice-oriented way forward for ethical technology design. It discusses workplace approaches to ethical technology design motivated and informed by the HCI literature.

Section 5 explores the limits of values-oriented design by exploring critical issues that design methods struggle to address, and the new research areas and opportunities opened by these limits. The conclusion, Section 6, offers some thoughts on moving forward as a field in a particularly challenging time for ethics in design.

In their monograph “Values as Hypotheses: Design, Inquiry, and the Service of Values,” wisely encourage values scholarship “to integrate stories from concrete situations of design practice” (JafariNaimi *et*

*al.*, 2015, p. 102) to keep values scholarship grounded in real-world contexts. Responding to this call, this monograph draws from my own research observations of design teams to illustrate controversies, values-oriented design methods, and open challenges in values-oriented design. By illustrating the broad values and ethics literature, controversies, methods, and open challenges, my hope is to help values scholars plan the next 30 years of designing just, equitable technologies.

## References

---

- Agre, P. E. 1997. "Toward a critical technical practice: Lessons learned in trying to reform AI". In: *Social Science, Technical Systems, and Cooperative Work: Beyond the Great Divide*. Ed. by G. C. Bowker, L. Gasser, S. L. Star, and B. Turner. Hillsdale, NJ: Erlbaum. 131–158.
- Albrechtslund, A. 2007. "Ethics and technology design". *Ethics and Information Technology*. 9(1): 63–72.
- Alexander, L. and M. Moore. 2012. "Deontological ethics". In: *The Stanford Encyclopedia of Philosophy*. Ed. by E. N. Zalta. Retrieved from: <http://plato.stanford.edu/archives/win2012/entries/ethics-deontological/>. Winter 2012.
- Alsheikh, T., J. A. Rode, and S. E. Lindley. 2011. "(Whose) value-sensitive design: A study of long-distance relationships in an Arabic cultural context". In: *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work*. New York, NY, USA: ACM. 75–84.
- Ames, M. G., J. Go, J. J. Kaye, and M. Spasojevic. 2011. "Understanding technology choices and values through social class". In: *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work*. <https://doi.org/10.1145/1958824.1958834>. New York, NY, USA: ACM. 55–64.

- Azenkot, S., S. Prasain, A. Borning, E. Fortuna, R. E. Ladner, and J. O. Wobbrock. 2011. "Enhancing independence and safety for blind and deaf-blind public transit riders". In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/1978942.1979424>. New York, NY, USA: ACM. 3247–3256.
- Bardzell, S. 2010. "Feminist HCI: Taking stock and outlining an agenda for design". In: *Proceedings of the 28th International Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/1753326.1753521>. New York, NY, USA: ACM. 1301–1310.
- Bellotti, V. 1998. "Design for privacy in multimedia computing and communications environments". In: *Technology and Privacy: The New Landscape*. Cambridge, MA and London: The MIT Press. 63–98.
- Bellotti, V. and A. Sellen. 1993. "Design for privacy in ubiquitous computing environments". In: *European Conference on Computer-Supported Cooperative Work ECSCW'93*. Milano, Italy: Dordrecht: Kluwer. 77–92.
- Bidwell, N. J. 2016. "Decolonising HCI and interaction design discourse: Some considerations in planning afriCHI". *XRDS*. 22(4): 22–27. <https://doi.org/10.1145/2930884>.
- Bidwell, N. J. and H. Winschiers-Theophilus. 2015. *At the Intersection of Indigenous and Traditional Knowledge and Technology Design*. Informing Science Press.
- Boast, R., M. Bravo, and R. Srinivasan. 2007. "Return to babel: Emergent diversity, digital resources, and local knowledge". *The Information Society*. 23(5): 395–403.
- Borning, A. and M. Muller. 2012. "Next steps for value sensitive design". In: *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems*. <https://doi.org/10.1145/2207676.2208560>. New York, NY, USA: ACM. 1125–1134.
- Bornmann, L. and R. Mutz. 2015. "Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references". *Journal of the Association for Information Science and Technology*. 66(11): 2215–2222. <http://doi.org/10.1002/asi.23329>.

- boyd, D. 2012. "White flight in networked publics? How race and class shaped American teen engagement with MySpace and Facebook". In: *Race After the Internet*. Ed. by L. Nakamura and P. Chow-White. New York and London: Routledge. 203–222.
- Breaking News. 2017. *RadioLab*. Retrieved from: [http://www.radiolab.org/story/breaking-news/?utm\\_source=sharedUrl&utm\\_medium=metatag&utm\\_campaign=sharedUrl](http://www.radiolab.org/story/breaking-news/?utm_source=sharedUrl&utm_medium=metatag&utm_campaign=sharedUrl).
- Brey, P. A. E. 2000a. "Disclosive computer ethics". *SIGCAS Computers and Society*. 30(4): 10–16.
- Brey, P. A. E. 2000b. "Method in computer ethics: Towards a multi-level interdisciplinary approach". *Ethics and Information Technology*. 2(2): 125–129. <http://doi.org/10.1023/A:1010076000182>.
- Briggs, P. and L. Thomas. 2015. "An inclusive, value sensitive design perspective on future identity technologies". *ACM Transactions Computers-Human Interactions*. 22(5): 23:1–23:28. <http://doi.org/10.1145/2778972>.
- Brown, B., A. Weilenmann, D. McMillan, and A. Lampinen. 2016. "Five provocations for ethical HCI Research". In: *Proceedings of the 34th annual ACM Conference on Human Factors in Computing Systems (CHI 2016)*. Retrieved from: <https://dl.acm.org/citation.cfm?id=2858313>. San Jose, CA: ACM.
- Bruckman, A. 2014. "Research ethics and HCI". In: *Ways of Knowing in HCI*. Ed. by J. S. Olson and W. A. Kellogg. [http://doi.org/10.1007/978-1-4939-0378-8\\_18](http://doi.org/10.1007/978-1-4939-0378-8_18). Springer New York. 449–468.
- Bynum, T. 2016. "Computer and information ethics". In: *Stanford Encyclopedia of Philosophy*. Retrieved from: <https://plato.stanford.edu/archives/win2016/entries/ethics-computer/>.
- Capurro, R. 2008. "Information ethics for and from Africa". *Journal of the American Society for Information Science and Technology*. 59(7): 1162–1170. <http://doi.org/10.1002/asi.20850>.
- Cavoukian, A. 2012. *Operationalizing Privacy by Design: A Guide to Implementing Strong Privacy Practices*. Retrieved from: <http://www.privacybydesign.ca/index.php/paper/operationalizing-privacy-by-design-a-guide-to-implementing-strong-privacy-practices/>. Ontario, Canada: Office of the Privacy Commissioner of Canada.



- Cheng, A.-S. and K. R. Fleischmann. 2010. “Developing a meta-inventory of human values”. *Proceedings of the American Society for Information Science and Technology*. 47(1): 1–10. <http://doi.org/10.1002/meet.14504701232>.
- Christen, K. 2012. “Does information really want to be free? Indigenous knowledge systems and the question of openness”. *International Journal of Communication*. 6: 2870–2893.
- Clement, A. 1990. “Cooperative support for computer work: A social perspective on the empowering of end users”. In: *Proceedings of the 1990 ACM Conference on Computer-supported Cooperative Work*. <http://doi.org/10.1145/99332.99357>. New York, NY, USA: ACM. 223–236.
- Cockburn, C. 1999. “Caught in the wheels: The high cost of being a female cog in the male machinery of engineering”. In: *The Social Shaping of Technology*. Ed. by D. MacKenzie and J. Wajcman. Buckingham UK Philadelphia: McGraw Hill Education/Open University.
- Cockton, G. 2004. “From quality in use to value in the world”. In: *Proceedings of CHI 2004*. 1287–1290.
- Cockton, G. 2008. “Designing worth — connecting preferred means to desired ends”. *Interactions Magazine*. 15(4): 54–57. <http://doi.org/10.1145/1374489.1374502>.
- Czeskis, A., I. Dermendjieva, H. Yapit, A. Borning, B. Friedman, B. Gill, and T. Kohno. 2010. “Parenting from the pocket: Value tensions and technical directions for secure and private parent-teen mobile safety”. In: *Proceedings of the Sixth Symposium on Usable Privacy and Security*. <http://doi.org/10.1145/1837110.1837130>. New York, NY, USA: ACM. 15:1–15:15.
- Davis, J. 2009. “Design methods for ethical persuasive computing”. In: *Proceedings of the 4th International Conference on Persuasive Technology*. <http://doi.org/10.1145/1541948.1541957>. New York, NY, USA: ACM. 6:1–6:8.
- Davis, J. and L. P. Nathan. 2015. “Value sensitive design: Applications, adaptations, and critiques”. In: *Handbook of Ethics, Values and Technological Design*. Ed. by J. van den Hoven, P. E. Vermaas, and I. Van der Poel. Springer. 11–40.

- Dix, A. 2017. “Where are the values? Locating and reasoning 25 years on”. Presented at the CHI 2017 Workshop on Values In Computing, Retrieved from: [http://www.valuesincomputing.org/wp-content/uploads/2017/03/dix\\_where\\_vic2017.pdf](http://www.valuesincomputing.org/wp-content/uploads/2017/03/dix_where_vic2017.pdf).
- Doubek, J. 2017. “How disinformation and distortions on social media affected elections worldwide”. Retrieved from: <https://www.npr.org/sections/alltechconsidered/2017/11/16/564542100/how-disinformation-and-distortions-on-social-media-affected-elections-worldwide>.
- Dourish, P., J. Finlay, P. Sengers, and P. Wright. 2004. “Reflective HCI: Towards a critical technical practice”. In: *CHI '04 Extended Abstracts on Human Factors in Computing Systems*. <http://doi.org/10.1145/985921.986203>. New York, NY, USA: ACM. 1727–1728.
- Driscoll, K. and S. Walker. 2014. “Working within a black box: Transparency in the collection and production of big twitter data”. *International Journal of Communication*. 8: 1745–1764.
- Driver, J. 2009. “The history of utilitarianism”. In: *The Stanford Encyclopedia of Philosophy, Summer 2009*. Ed. by E. N. Zalta. Retrieved from: <http://plato.stanford.edu/archives/sum2009/entries/utilitarianism-history/>.
- Eglash, R. 2002. “Race, sex and nerds: From black geeks to Asian American hipsters”. *Social Text*. 20(2): 49–64.
- Ess, C. 2009. *Digital Media Ethics*. Cambridge, UK and Malden, MA: Polity Press.
- Ferrario, M. A. 2017. “The Denver manifesto — values in computing”. Retrieved from: <http://www.valuesincomputing.org/2017/05/11/the-denver-manifesto/>.
- Fiesler, C., S. Morrison, and A. S. Bruckman. 2016. “An archive of their own: A case study of feminist HCI and values in design”. In: *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/2858036.2858409>. New York, NY, USA: ACM. 2574–2585.
- Fisher, E. 2007. “Ethnographic invention: Probing the capacity of laboratory decisions”. *NanoEthics*. 1(2): 155–165.

- Fisher, E. and R. Mahajan. 2010. "Embedding the humanities in engineering: Art, dialogue, and a laboratory". In: *Trading Zones and Interactional Expertise: Creating New Kinds of Collaboration*. Ed. by M. E. Gorman. Cambridge, MA: MIT Press. 209–230.
- Fisher, E., M. O'Rourke, R. Evans, E. B. Kennedy, M. E. Gorman, and T. P. Seager. 2015. "Mapping the integrative field: Taking stock of socio-technical collaborations". *Journal of Responsible Innovation*. 2(1): 39–61. <http://doi.org/10.1080/23299460.2014.1001671>.
- Flanagan, M. and H. Nissenbaum. 2014. *Values at Play in Digital Games*. 1st. Cambridge, Massachusetts: The MIT Press.
- Fleischmann, K. R. 2013. *Information and Human Values*. Morgan & Claypool Publishers.
- Fleischmann, K. R., W. A. Wallace, and J. M. Grimes. 2011. "How values can reduce conflicts in the design process: Results from a multi-site mixed-method field study". *Proceedings of the American Society for Information Science and Technology*. 48(1): 1–10. <http://doi.org/10.1002/meet.2011.14504801147>.
- Friedman, B. 1997. *Human Values and the Design of Computer Technology*. Cambridge and New York: Cambridge University Press.
- Friedman, B., A. Borning, J. L. Davis, B. T. Gill, P. H. Kahn, T. Kriplean, and P. Lin. 2008. "Laying the foundations for public participation and value advocacy: Interaction design for a large scale urban simulation". In: *Proceedings of the 2008 International Conference on Digital Government Research*. Retrieved from: <http://portal.acm.org/citation.cfm?id=1367883>. Montreal, Canada: Digital Government Society of North America. 305–314.
- Friedman, B., N. G. Freier, and P. H. Kahn Jr. 2004. "Office window of the future?: Two case studies of an augmented window". In: *CHI '04 Extended Abstracts on Human Factors in Computing Systems*. <http://doi.org/10.1145/985921.986135>. New York, NY, USA: ACM. 1559–1559.

- Friedman, B. and D. G. Hendry. 2012. “The envisioning cards: A toolkit for catalyzing humanistic and technical imaginations”. In: *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/2207676.2208562>. New York, NY, USA: ACM. 1145–1148.
- Friedman, B., D. G. Hendry, and A. Borning. 2017. “A survey of value sensitive design methods”. *Foundations and Trends in Human-Computer Interaction*. 11(23): 63–125.
- Friedman, B. and P. H. Kahn. 1992. “Human agency and responsible computing: Implications for computer system design”. *Journal of Systems and Software*. 17(1): 7–14. [http://doi.org/10.1016/0164-1212\(92\)90075-U](http://doi.org/10.1016/0164-1212(92)90075-U).
- Friedman, B. and P. H. Kahn. 2003. “Human values, ethics and design”. In: *The Human-computer Interaction Handbook*. Ed. by J. A. Jacko and A. Sears. Retrieved from: <http://dl.acm.org/citation.cfm?id=772072.772147>. Hillsdale, NJ, USA: L. Erlbaum Associates Inc. 1177–1201.
- Friedman, B., P. H. Kahn, and A. Borning. 2002. *Value Sensitive Design: Theory and Methods*. Retrieved from: <http://faculty.washington.edu/pkahn/articles/vsd-theory-methods-tr.pdf>. Seattle, WA: University of Washington. 1–8.
- Friedman, B., P. H. Kahn, and A. Borning. 2006. “Value sensitive design and information systems”. In: *Human-Computer Interaction and Management Information Systems: Applications*. Ed. by D. Galletta and P. Zhang. Vol. 5. New York: M.E. Sharpe. 348–372.
- Friedman, B., P. H. Kahn, and J. Hagman. 2003. “Hardware companions?: What online AIBO discussion forums reveal about the Human-Robotic relationship”. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/642611.642660>. New York, NY, USA: ACM. 273–280.
- Friedman, B. and H. Nissenbaum. 1997. “Bias in computer systems”. In: *Human Values and the Design of Computer Technology*. Ed. by B. Friedman. Cambridge and New York: Cambridge University Press. 21–40.

- Gandy, O. H. 2012. "Matrix multiplication and the digital divide". In: *Race After the Internet*. Ed. by L. Nakamura and P. Chow-White. New York and London: Routledge. 128–145.
- Gispen, J. n.d. "Ethics for designers". Retrieved from: <https://www.ethicsfordesigners.com/>.
- Greene, D. and K. Shilton. 2017. "Platform privacies: Governance, collaboration, and the different meanings of "privacy" in iOS and Android development". *New Media & Society*. <http://doi.org/10.1177/1461444817702397>.
- Guston, D. H. and D. Sarewitz. 2002. "Real-time technology assessment". *Technology in Society*. 24(1–2): 93–109.
- Haimson, O. L. and A. L. Hoffmann. 2016. "Constructing and enforcing "authentic" identity online: Facebook, real names, and non-normative identities". *First Monday*. 21(6). <http://doi.org/10.5210/fm.v21i6.6791>.
- Hankerson, D., A. R. Marshall, J. Booker, H. El Mimouni, I. Walker, and J. A. Rode. 2016. "Does technology have race?" In: *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*. <http://doi.org/10.1145/2851581.2892578>. New York, NY, USA: ACM. 473–486.
- Hargittai, E. 2012. "Open doors, closed spaces? Differentiated adoption of social network sites by user background". In: *Race After the Internet*. Ed. by L. Nakamura and P. Chow-White. London and New York: Routledge. 223–245.
- Hargittai, E. 2015. "Is bigger always better? Potential biases of big data derived from social network sites". *The ANNALS of the American Academy of Political and Social Science*. 659(1): 63–76. <http://doi.org/10.1177/0002716215570866>.
- Huff, C., L. Barnard, and W. Frey. 2008. "Good computing: A pedagogically focused model of virtue in the practice of computing (part 1)". *Journal of Information, Communication & Ethics in Society*. 6(3): 246–278.

- Huldtgren, A. 2015. "Design for values in ICT Information and communication technologies". In: *Handbook of Ethics, Values, and Technological Design*. Ed. by J. van den Hoven, P. E. Vermaas, and I. van de Poel. [http://doi.org/10.1007/978-94-007-6970-0\\_35](http://doi.org/10.1007/978-94-007-6970-0_35). Springer Netherlands. 739–767.
- Hursthouse, R. 2013. "Virtue ethics". In: *The Stanford Encyclopedia of Philosophy*. Ed. by E. N. Zalta. Retrieved from: <http://plato.stanford.edu/archives/fall2013/entries/ethics-virtue/>.
- Introna, L. D. and H. Nissenbaum. 2000. "Shaping the web: Why the politics of search engines matters". *The Information Society*. 16(3): 169–185. <http://doi.org/10.1080/01972240050133634>.
- Irani, L. C. and P. Dourish. 2009. "Postcolonial interculturality". In: *Proceedings of the 2009 International Workshop on Intercultural Collaboration*. <http://doi.org/10.1145/1499224.1499268>. New York, NY, USA: ACM. 249–252.
- Irani, L., J. Vertesi, P. Dourish, K. Philip, and R. E. Grinter. 2010. "Postcolonial computing: A lens on design and development". In: *Proceedings of the 28th International Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/1753326.1753522>. New York, NY, USA: ACM. 1311–1320.
- JafariNaimi, N., L. Nathan, and I. Hargraves. 2015. "Values as hypotheses: Design, inquiry, and the service of values". *Design Issues*. 31(4): 91–104. [http://doi.org/10.1162/DESI\\_a\\_00354](http://doi.org/10.1162/DESI_a_00354).
- Johnson, D. G. 2000. *Computer Ethics*. 3rd. Upper Saddle River, NJ: Prentice Hall.
- Johnson, D. G. 2011. "Software agents, anticipatory ethics, and accountability". In: *The Growing Gap Between Emerging Technologies and Legal-Ethical Oversight*. Ed. by G. E. Marchant, B. R. Allenby, and J. R. Herkert. Retrieved from: [http://link.springer.com.proxy-um.researchport.umd.edu/chapter/10.1007/978-94-007-1356-7\\_5](http://link.springer.com.proxy-um.researchport.umd.edu/chapter/10.1007/978-94-007-1356-7_5). Springer Netherlands. 61–76.
- Kline, R. and T. Pinch. 1999. "The social construction of technology". In: *The Social Shaping of Technology*. Ed. by D. MacKenzie and J. Wajcman. Buckingham, UK; Philadelphia: McGraw Hill Education/Open University. 113–115.

- Kling, R., A. Hopper, and J. Katz. 1992. "Controversies about privacy and open information in CSCW". In: *Proceedings of the 1992 ACM Conference on Computer-supported Cooperative Work*. <http://doi.org/10.1145/143457.371594>. New York, NY, USA: ACM. 15.
- Kling, R., G. McKim, and A. King. 2003. "A bit more to it: Scholarly communication forums as socio-technical interaction networks". *Journal of the American Society for Information Science and Technology*. 54(1): 47–67. <http://doi.org/10.1002/asi.10154>.
- Kluckhohn, C. 1951. "Values and value-orientations in the theory of action: An exploration in definition and classification". In: *Toward a General Theory of Action*. Ed. by T. Parsons and E. Shils. Cambridge, MA: Harvard University Press. 388–433.
- LeDantec, C. A. L., E. S. Poole, and S. P. Wyche. 2009. "Values as lived experience: Evolving value sensitive design in support of value discovery". In: *Proceedings of the 27th International Conference on Human Factors in Computing Systems (CHI)*. Retrieved from: <http://portal.acm.org/citation.cfm?id=1518701.1518875&coll=ACM&dl=ACM&type=series&idx=SERIES260&part=series&WantType=Proceedings&title=CHI&CFID=30156767&CFTOKEN=97894460>. Boston, MA, USA: ACM. 1141–1150.
- Lewis, P. 2017. "'Our minds can be hijacked': The tech insiders who fear a smartphone dystopia". *The Guardian*. Retrieved from: <http://www.theguardian.com/technology/2017/oct/05/smartphone-addiction-silicon-valley-dystopia>.
- Light, A. 2011. "HCI as heterodoxy: Technologies of identity and the queering of interaction with computers". *Interacting with Computers*. 23(5): 430–438. <http://doi.org/10.1016/j.intcom.2011.02.002>.
- Lindgreen, A., F. Maon, J. Reast, and M. Yani-De-Soriano. 2012. "Guest editorial: Corporate social responsibility in controversial industry sectors". *Journal of Business Ethics*. 110(4): 393–395. <http://doi.org/10.1007/s10551-012-1488-y>.
- Loo, S. 2012. "Design-ing ethics". In: *Design and Ethics: Reflections on Practice*. Ed. by E. Felton, O. Zelenko, and S. Vaughan. London and New York: Routledge. 10–19.

- MacKenzie, D. and J. Wajcman, eds. 1999. *The Social Shaping of Technology*. 2nd. Buckingham UK; Philadelphia: McGraw Hill Education/Open University.
- Mainsah, H. and A. Morrison. 2014. "Participatory design through a cultural lens: Insights from postcolonial theory". In: *Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium Papers, and Key note Abstracts*. Vol. 2. <http://doi.org/10.1145/2662155.2662195>. New York, NY, USA: ACM. 83–86.
- Manders-Huits, N. and M. Zimmer. 2012. "Values and pragmatic action: The challenges of engagement with technical communities in support of value-conscious design". In: *Design and Ethics: Reflections on Practice*. Ed. by E. Felton, O. Zelenko, and S. Vaughan. London and New York: Routledge.
- Merritt, S. and S. Bardzell. 2011. "Postcolonial language and culture theory for HCI4D". In: *CHI '11 Extended Abstracts on Human Factors in Computing Systems*. <http://doi.org/10.1145/1979742.1979827>. New York, NY, USA: ACM. 1675–1680.
- Metcalf, J. and K. Crawford. 2016. "Where are human subjects in big data research? The emerging ethics divide". *Big Data & Society*. 3(1). <https://doi.org/10.1177/2053951716650211>.
- Miller, J. K., B. Friedman, and G. Jancke. 2007. "Value tensions in design: The value sensitive design, development, and appropriation of a corporation's groupware system". In: *Proceedings of the 2007 International ACM Conference on Supporting Group Work*. Retrieved from: <http://portal.acm.org/citation.cfm?id=1316624.1316668>. Sanibel Island, Florida, USA: ACM. 281–290.
- Moor, J. H. 1985. "What is computer ethics?" *Metaphilosophy*. 16(4): 266–275. <http://doi.org/10.1111/j.1467-9973.1985.tb00173.x>.
- Muller, M. 2014. "Whose values? Whose design?" In: *Proceedings of the CSCW 2014 Workshop on Co-Creating and Identity-Making in CSCW*. Baltimore, MD: ACM.



- Mun, M. Y., D. H. Kim, K. Shilton, D. Estrin, M. Hansen, and R. Govindan. 2014. "PDVLoc: A personal data vault for controlled location data sharing". *ACM Transactions on Sensor Networks*. 10(4). <https://doi.org/10.1145/2523820>.
- Munteanu, C., H. Molyneaux, W. Moncur, M. Romero, S. O'Donnell, and J. Vines. 2015. "Situational ethics: Re-thinking approaches to formal ethics requirements for Human-Computer Interaction". In: *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/2702123.2702481>. New York, NY, USA: ACM. 105–114.
- Nakamura, L. 2000. "Where do you want to go today? Cybernetic tourism, the Internet, and transnationality". In: *Race in Cyberspace*. Ed. by B. Kolko, L. Nakamura, and G. Rodman. New York: Routledge. 15–26.
- Narayanan, A. and S. Vallor. 2014. "Why software engineering courses should include ethics coverage". *Communications of the ACM*. 57(3): 23–25. <http://doi.org/10.1145/2566966>.
- Office of the Secretary of The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. 1979. *The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research*. Department of Health, Education, and Welfare.
- O'Neil, C. 2017. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. reprint. New York: Broadway Books.
- Oosterlaken, I. 2015. "Applying value sensitive design (VSD) to wind turbines and wind parks: An exploration". *Science and Engineering Ethics*. 21(2): 359–379. <http://doi.org/10.1007/s11948-014-9536-x>.
- Pfaffenberger, B. 1992. "Technological dramas". *Science, Technology & Human Values*. 17(3): 282–312.
- Pinch, T. J. and W. E. Bijker. 1984. "The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other". *Social Studies of Science*. 14(3): 399–441.

- Ratto, M. 2011. "Critical making: Conceptual and material studies in technology and social life". *The Information Society*. 27(4): 252–260. <http://doi.org/10.1080/01972243.2011.583819>.
- Ratto, M. 2014. "Textual doppelgangers: Critical issues in the study of technology". In: *DIY Citizenship: Critical Making and Social Media*. Ed. by M. Ratto and M. Boler. Cambridge Massachusetts: The MIT Press. 227–236.
- Ratto, M. and M. Boler. 2014. "Introduction". In: *DIY Citizenship: Critical Making and Social Media*. Cambridge Massachusetts: The MIT Press. 1–22.
- Rawls, J. 1999. *A Theory of Justice*. Cambridge, MA: Belknap Press of Harvard University Press.
- Reddy, S., K. Shilton, G. Denisov, C. Cenizal, D. Estrin, and M. Srivastava. 2010. "Biketastic: Sensing and mapping for better biking". In: *ACM Conference on Human Factors in Computing Systems (CHI)*. <http://doi.org/10.1145/1753326.1753598>. Atlanta, GA: ACM. 1817–1820.
- Rosenberg, M., N. Confessore, and C. Cadwalladr. 2018. *How trump consultants exploited the facebook data of millions*. The New York Times, Retrieved from: <https://www.nytimes.com/2018/03/17/us/politics/cambridge-analytica-trump-campaign.html>.
- Rotondo, A. and N. G. Freier. 2010. "The problem of defining values for design: A lack of common ground between industry and academia?" In: *CHI'10 Extended Abstracts on Human Factors in Computing Systems*. ACM. 4183–4188.
- Sawyer, S. 2005. "Social informatics: Overview, principles and opportunities". *Bulletin of the American Society for Information Science and Technology*. 31(5): 9–12. <http://doi.org/10.1002/bult.2005.1720310504>.
- Sawyer, S. and M. Jarrahi. 2014. "The sociotechnical perspective". In: *CRC Handbook of Computing*. Ed. by A. Tucker and H. Topi. New York: Chapman and Hall. 5-1-5–27.

- Schlesinger, A., W. K. Edwards, and R. E. Grinter. 2017. "Intersectional HCI: Engaging identity through gender, race, and class". In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. <http://doi.org/10.1145/3025453.3025766>. New York, NY, USA: ACM. 5412–5427.
- Sengers, P., K. Boehner, S. David, and J. J. Kaye. 2005. "Reflective design". In: *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility*. Retrieved from: <http://doi.acm.org/10.1145/1094562.1094569>. New York, NY, USA: ACM. 49–58.
- Sengers, P., J. McCarthy, and P. Dourish. 2006. "Reflective HCI: Articulating an agenda for critical practice". In: *CHI '06 Extended Abstracts on Human Factors in Computing Systems*. Montreal, CA: ACM. 1683–1686.
- Shilton, K. 2009. "Four billion little brothers?: Privacy, mobile phones, and ubiquitous data collection". *Communications of the ACM*. 52(11): 48–53. <http://doi.org/10.1145/1592761.1592778>.
- Shilton, K. 2013. "Values levers: Building ethics into design". *Science, Technology & Human Values*. 38(3): 374–397. <http://doi.org/10.1177/0162243912436985>.
- Shilton, K. 2015. "Anticipatory ethics for a future Internet: Analyzing values during the design of an Internet infrastructure". *Science and Engineering Ethics*. 21(1): 1–18. <http://doi.org/10.1007/s11948-013-9510-z>.
- Shilton, K. 2018. "Engaging values despite neutrality: challenges and approaches to values reflection during the design of internet infrastructure". *Science, Technology and Human Values*. 43(2): 247–269. <http://doi.org/10.1177/0162243917714869>.
- Shilton, K. and S. Anderson. 2017. "Blended, not bossy: Ethics roles, responsibilities and expertise in design". *Interacting with Computers*. 29(1): 71–79. <http://doi.org/10.1093/iwc/iww002>.
- Shilton, K., J. A. Burke, K. C. Claffy, and L. Zhang. 2016. "Anticipating policy and social implications of named data networking". *Communications of the ACM*. 59(12): 92–101. <http://doi.org/10.1145/2915915>.

- Shilton, K. and D. Greene. 2017. "Linking platforms, practices, and developer ethics: Levers for privacy discourse in mobile application development". *Journal of Business Ethics*. <http://doi.org/10.1007/s10551-017-3504-8>.
- Shilton, K., J. A. Koepfler, and K. R. Fleischmann. 2013. "Charting sociotechnical dimensions of values for design research". *The Information Society*. 29(5): 259–271. <http://doi.org/10.1080/01972243.2013.825357>.
- Shilton, K., J. A. Koepfler, and K. R. Fleischmann. 2014. "How to see values in social computing: Methods for studying values dimensions". In: *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW 2014)*. <http://doi.org/10.1145/2531602.2531625>. Baltimore, MD: ACM. 426–435.
- Singer, N. 2018. "Tech's ethical 'dark side': Harvard, Stanford and others want to address it". In: *The New York Times*. Retrieved from: <https://www.nytimes.com/2018/02/12/business/computer-science-ethics-courses.html>.
- Spiekermann, S. 2015. *Ethical IT Innovation: A Value-Based System Design Approach*. Boca Raton: Auerbach Publications.
- Srinivasan, R. 2017. *Whose Global Village?: Rethinking How Technology Shapes Our World*. New York: NYU Press.
- Tong, R. and N. Williams. 2016. "Feminist ethics". In: *The Stanford Encyclopedia of Philosophy*. Ed. by E. N. Zalta. Retrieved from: <https://plato.stanford.edu/archives/win2016/entries/feminism-ethics/>. Metaphysics Research Lab, Stanford University, Winter 2016.
- Vallor, S. 2016. *Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting*. 1st. New York, NY: Oxford University Press.
- van den Hoven, J. 2017. "Ethics for the digital age: Where are the moral specs?" In: *Informatics in the Future*. [http://doi.org/10.1007/978-3-319-55735-9\\_6](http://doi.org/10.1007/978-3-319-55735-9_6). Springer, Cham. 65–76.
- van Wynsberghe, A. and S. Robbins. 2014. "Ethicist as designer: A pragmatic approach to ethics in the lab". *Science and Engineering Ethics*. 20(4): 947–961. <http://doi.org/10.1007/s11948-013-9498-4>.

- Velasquez, M., C. Andre, T. Shanks, and Meyer. 1987. "A definition of ethics in terms of standards such as rights and fairness". *Issues in Ethics*. 1(1). Retrieved from: <https://www.scu.edu/ethics/ethics-resources/ethical-decision-making/what-is-ethics/>.
- Vitak, J., N. Proferes, K. Shilton, and Z. Ashktorab. 2017. "Ethics regulation in social computing research: Examining the role of institutional review boards". *Journal of Empirical Research on Human Research Ethics*. <http://doi.org/10.1177/1556264617725200>.
- Vitak, J., K. Shilton, and Z. Ashktorab. 2016. "Beyond the Belmont principles: Ethical challenges, practices, and beliefs in the online data research community". In: *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW 2016)*. San Francisco, CA: ACM.
- Wachter-Boettcher, S. 2017. *Technically Wrong: Sexist Apps, Biased Algorithms, and Other Threats of Toxic Tech*. 1st. New York, NY: W. W. Norton & Company.
- Wagner, I. 1992. "Caught in a web of fuzzy problems: Confronting the ethical issues in systems design". In: *Proceedings of the 2nd Biennial Participatory Design Conference*. Retrieved from: <http://ojs.ruc.dk/index.php/pdc/article/view/74>. Cambridge, MA. 23–30.
- Wajcman, J. 2010. "Domestic technology: Labour-saving or enslaving?" In: *Technology and Values: Essential Readings*. Ed. by C. Hanks. Malden, MA: Wiley-Blackwell. 273–288.
- Waycott, J., G. Wadley, S. Schutt, A. Stabolidis, and R. Lederman. 2015. "The challenge of technology research in sensitive settings: Case studies in "Ensitive HCI"". In: *Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction*. <http://doi.org/10.1145/2838739.2838773>. New York, NY, USA: ACM. 240–249.
- Weber, R. N. 1999. "Manufacturing gender in military cockpit design". In: *The Social Shaping of Technology*. Ed. by D. MacKenzie and J. Wajcman. Buckingham UK; Philadelphia: McGraw Hill Education/Open University.
- Winner, L. 1980. "Do artifacts have politics?" *Daedalus*. 109(1): 121–136.

- Winner, L. 1989. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. 1st. Chicago: University Of Chicago Press.
- Woelfer, J. P., A. Iverson, D. G. Hendry, B. Friedman, and B. T. Gill. 2011. “Improving the safety of homeless young people with mobile phones: Values, form and function”. In: *Proceedings of the 2011 annual conference on Human factors in computing systems*. <http://doi.org/10.1145/1978942.1979191>. New York, NY, USA: ACM. 1707–1716.
- Wong, R. Y., D. K. Mulligan, E. Van Wyk, J. Pierce, and J. Chuang. 2018. “Eliciting values reflections by engaging privacy futures using design workbooks”. In: *Proceedings of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing*. Retrieved from: <https://escholarship.org/uc/item/78c2802k>. Jersey City, NJ: ACM.
- Zelenko, O. and E. Felton. 2012. “Framing design and ethics”. In: *Design and Ethics: Reflections on Practice*. Ed. by E. Felton, O. Zelenko, and S. Vaughan. London and New York: Routledge. 3–9.